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(54) **IMAGE FORMING SYSTEM AND METHOD TO CONTROL AN IMAGE FORMING SYSTEM**

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B41J 3/60 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 13/009*** (2013.01); ***B41J 3/60*** (2013.01); ***B41J 13/0009*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 13/009; B41J 3/60; B41J 13/0009
See application file for complete search history.

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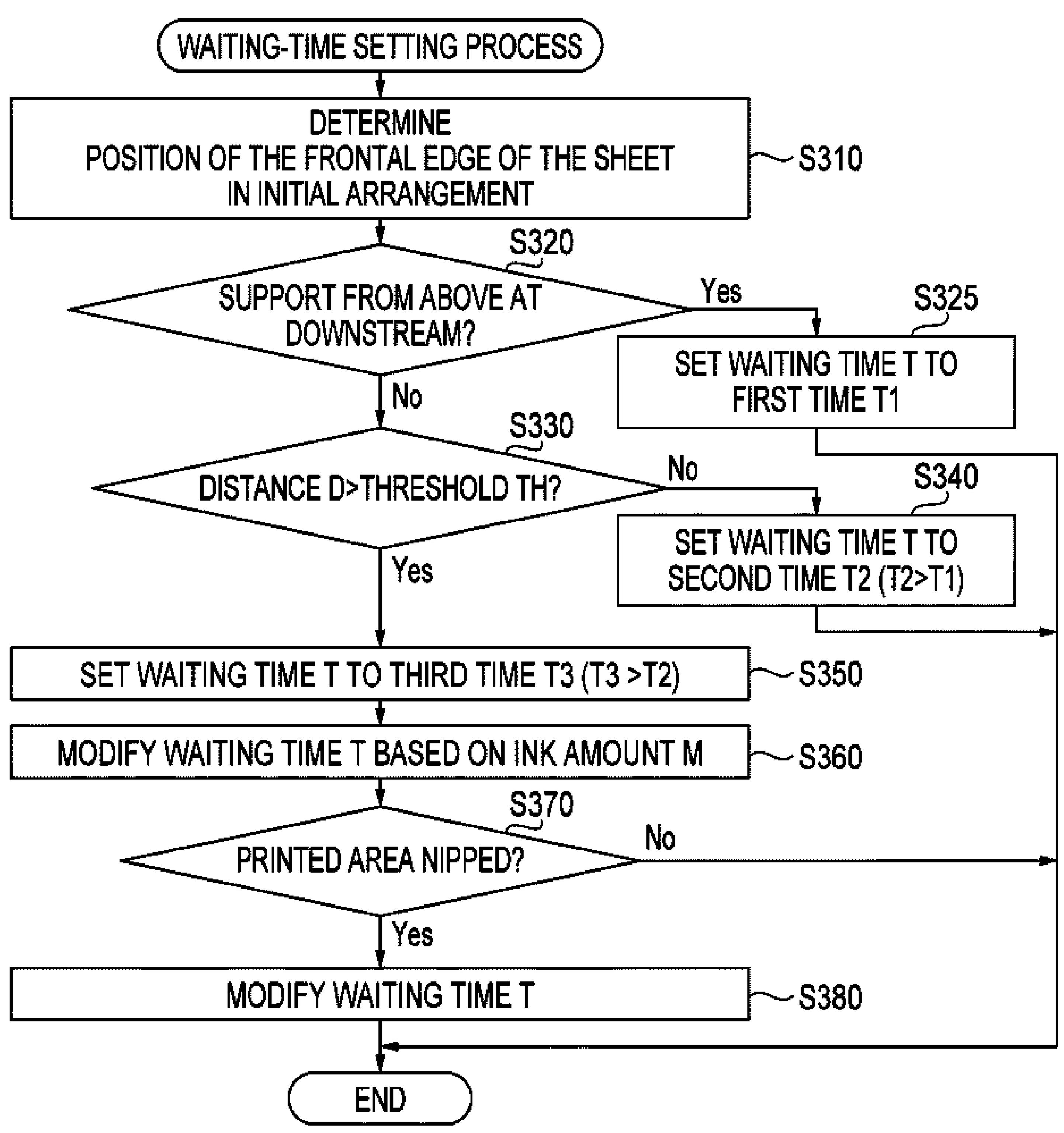
(57) **ABSTRACT**

An image forming system, having a recording head, a sheet conveyer, an inverting mechanism, and a controller, is provided. The sheet conveyer conveys a sheet in a sheet-conveying direction. The sheet is nipped at nipping points located at positions upstream and downstream in the sheet-conveying direction with respect to a discharging position. The inverting mechanism inverts the sheet from a first side to the second side. The controller determines an initial arrangement of the sheet in the sheet conveyer where image-forming on the second side starts, and controls a length of a period between time, when image-forming on the first side of the sheet in the posture with the first side facing the recording sheet is completed, and time, when the image-forming on the second side of the sheet inverted and refed to the sheet conveyer starts, based on the determined initial arrangement of the sheet in the sheet conveyer.

12 Claims, 9 Drawing Sheets



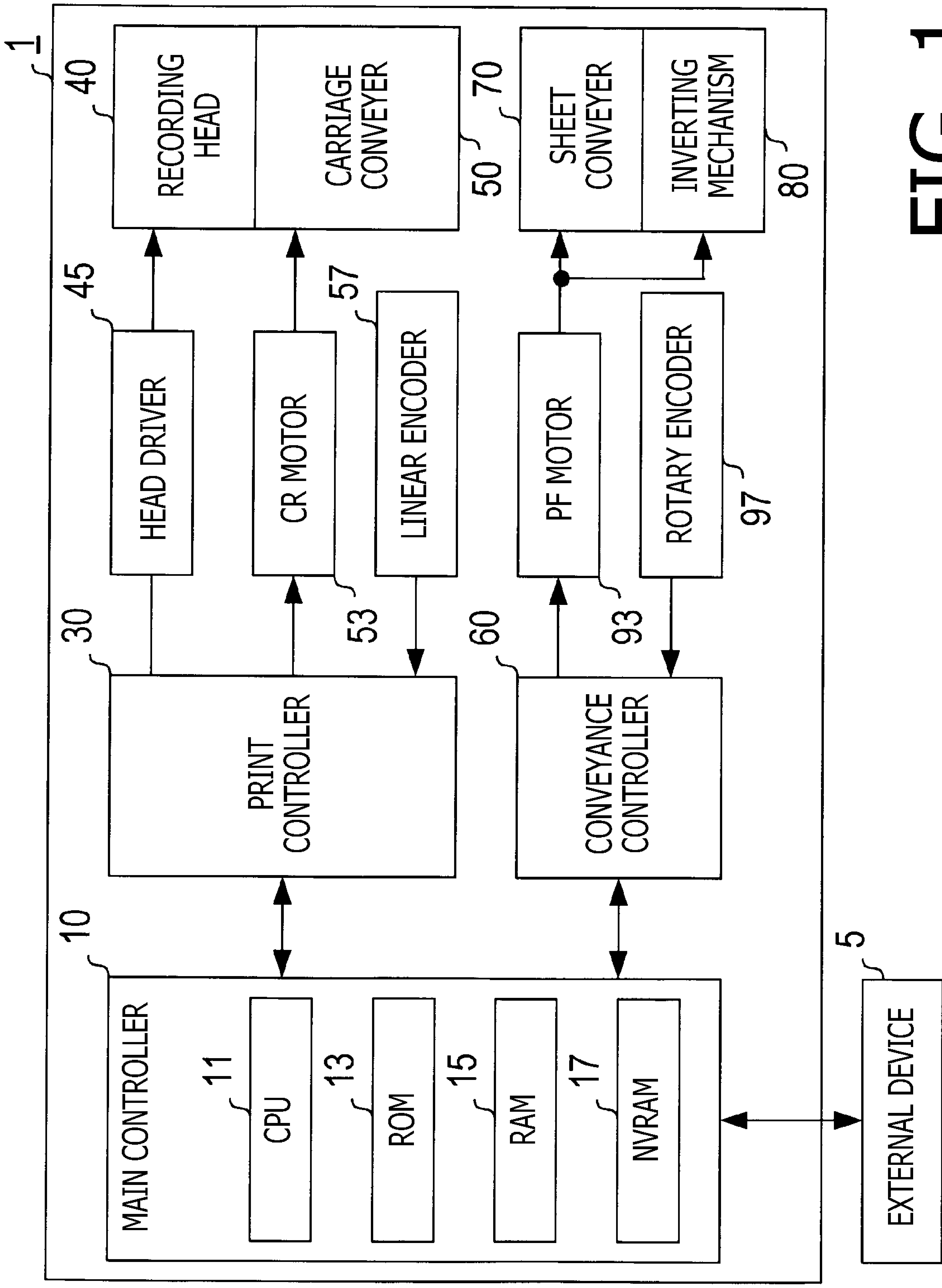

1
40
RECORDING HEAD
CARRIAGE CONVEYER
50
70
SHEET CONVEYER
INVERTING MECHANISM
80
45
HEAD DRIVER
CR MOTOR
57
LINEAR ENCODER
PF MOTOR
ROTARY ENCODER
97
30
PRINT CONTROLLER
53
60
CONVEYANCE CONTROLLER
93
10
MAIN CONTROLLER
11
CPU
13
ROM
15
RAM
17
NVRAM
5
EXTERNAL DEVICE

FIG. 1

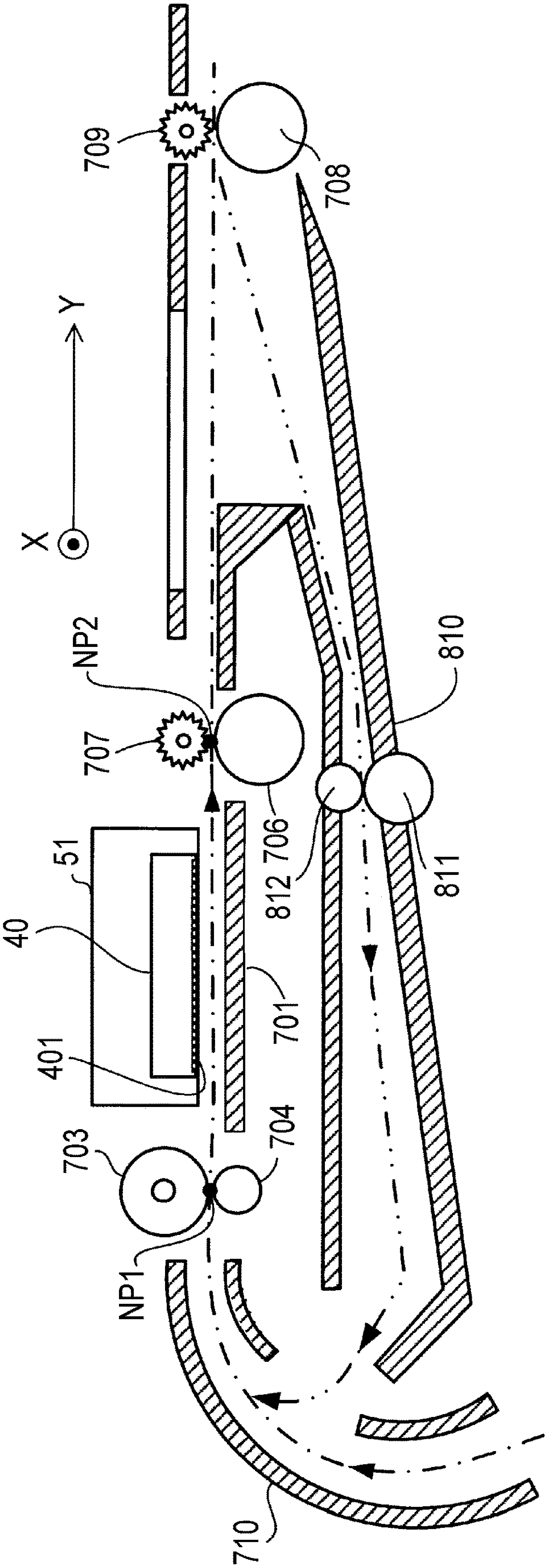


FIG. 2

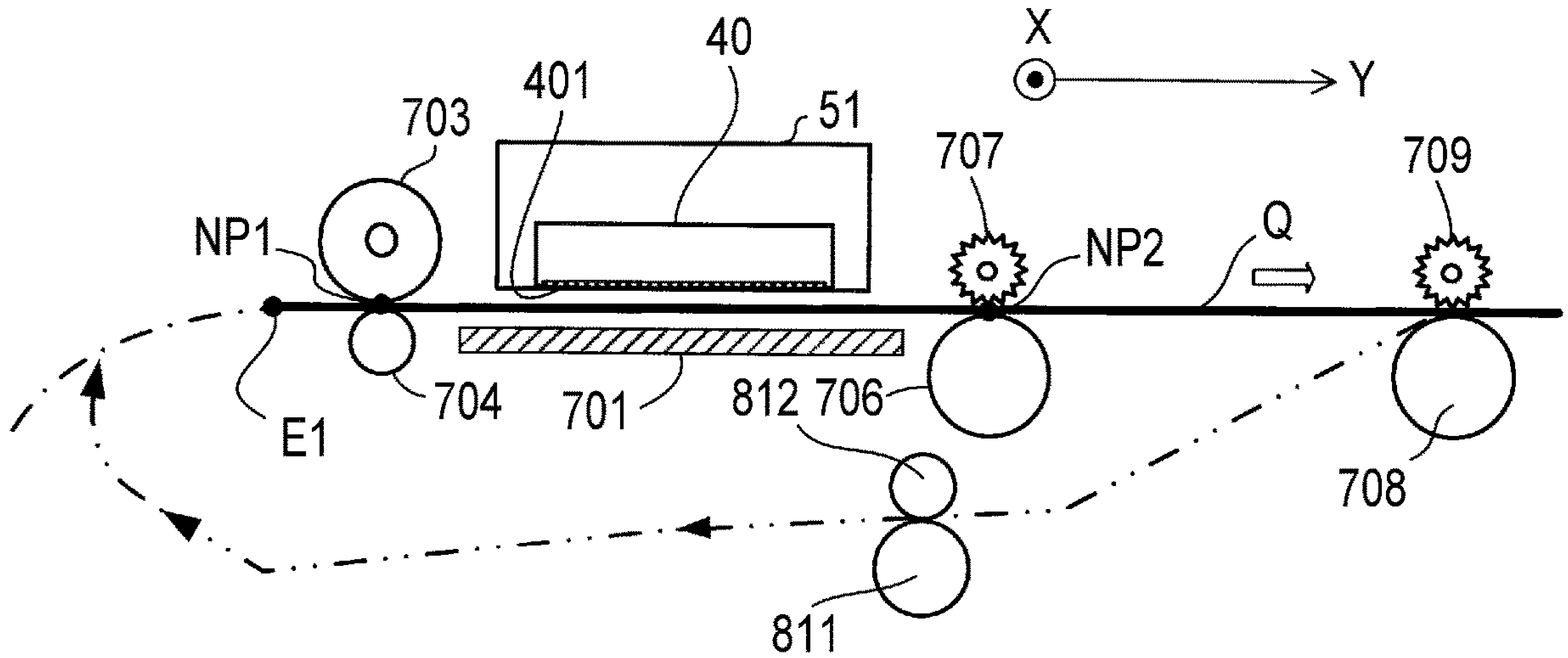

X
Y
40
401
51
703
707
709
NP1
NP2
Q
E1
704
701
812
706
708
811

FIG. 3A

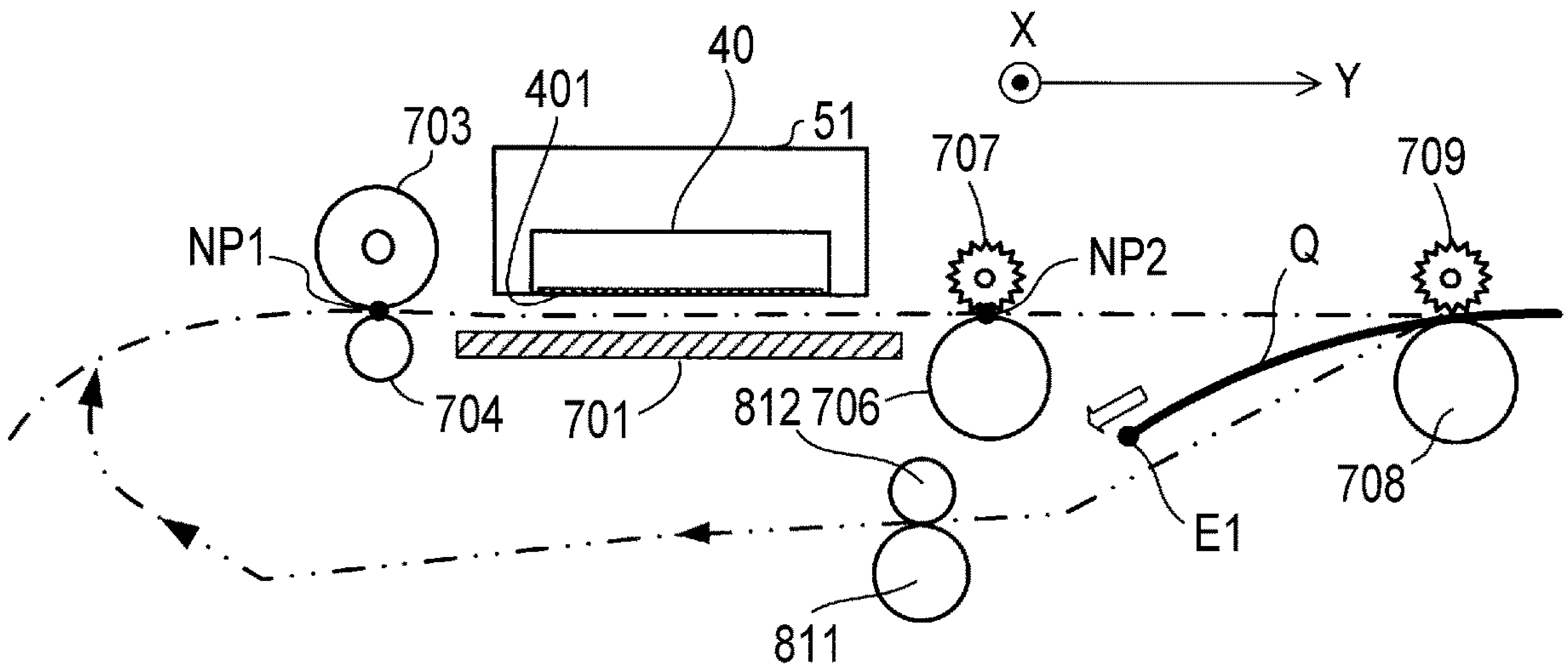

X
Y
40
401
51
703
707
709
NP1
NP2
Q
704
701
812
706
708
E1
811

FIG. 3B

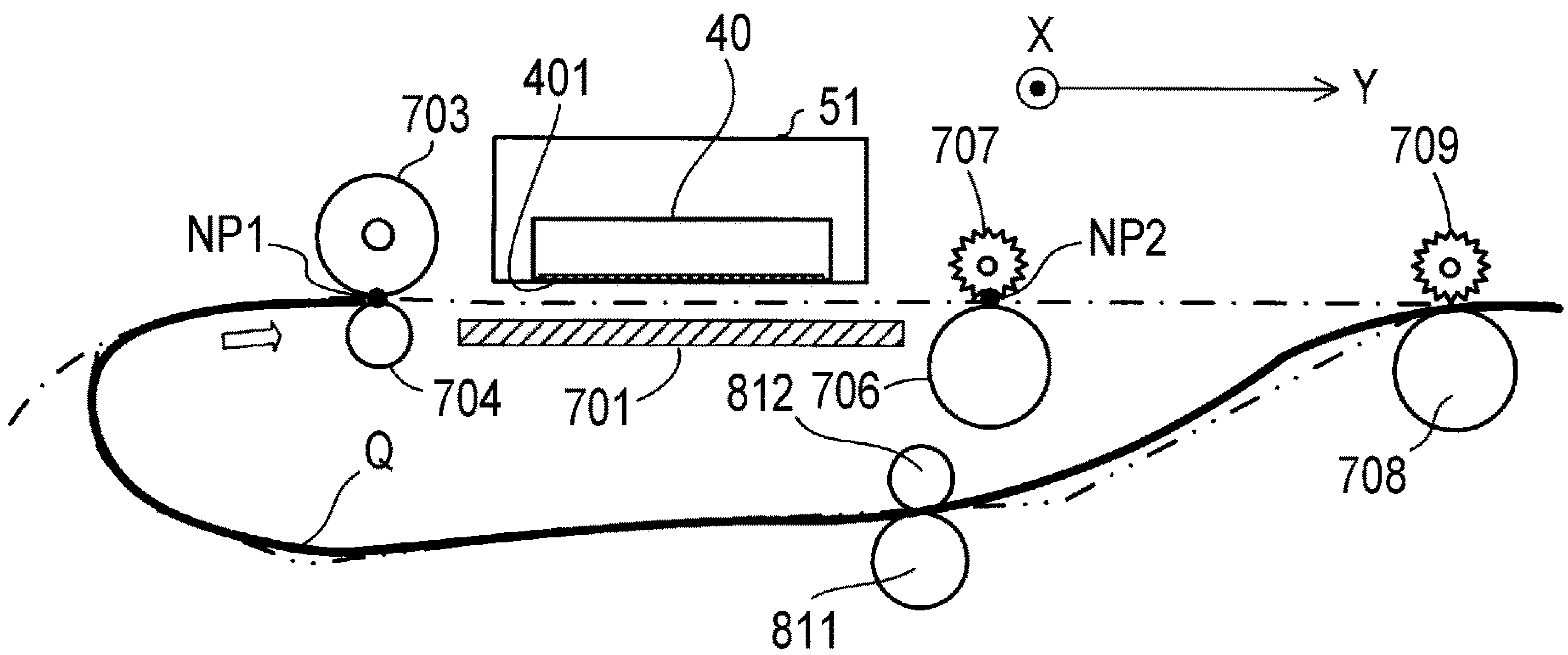
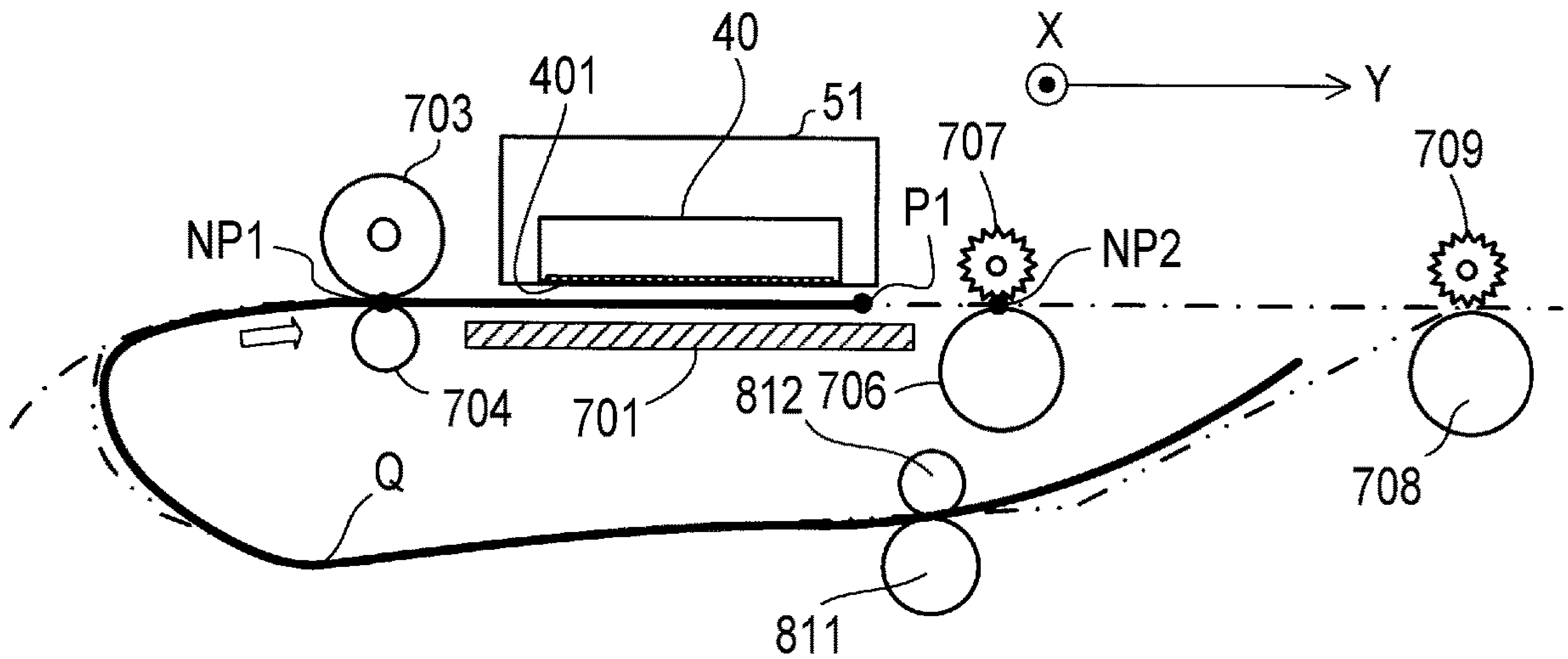
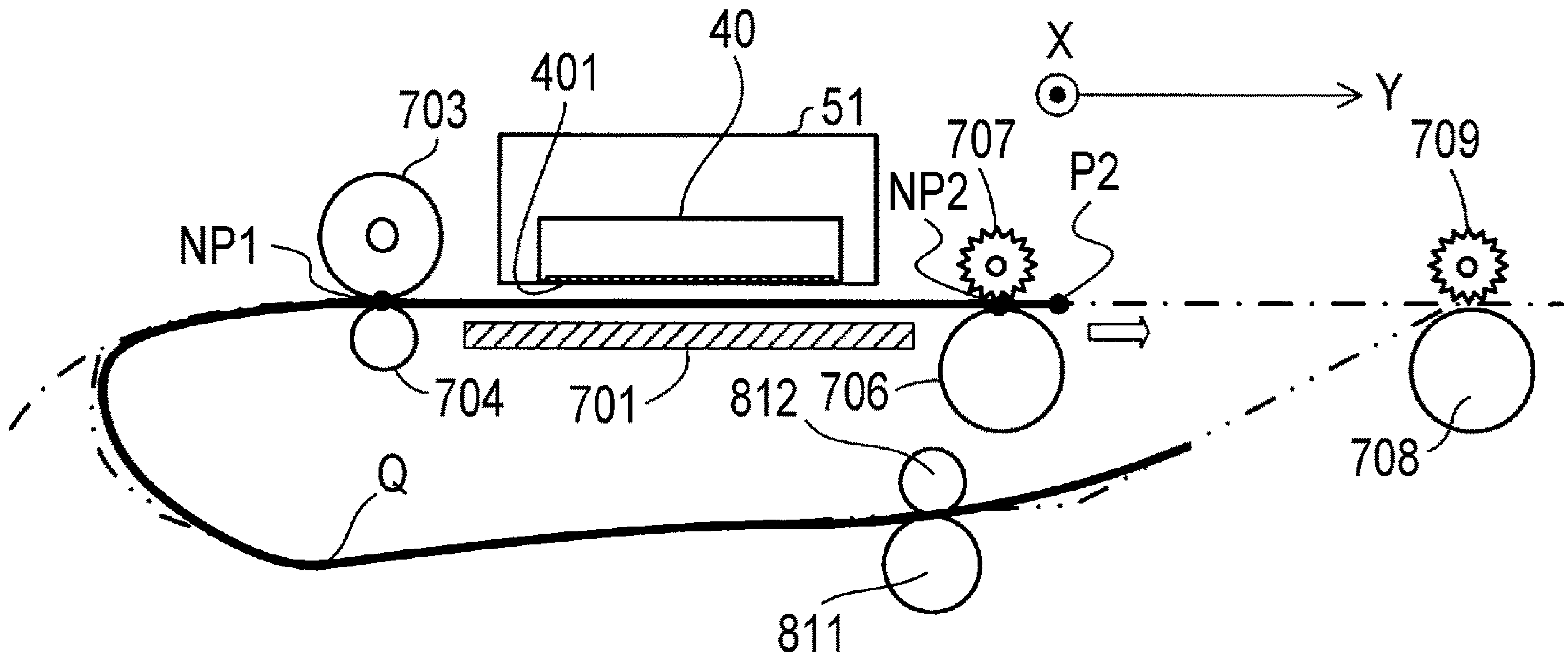


FIG. 4



40
401
51
703
X
Y
707
709
NP1
P1
NP2
704
701
812
706
708
Q
811

FIG. 5A



40
401
51
703
X
Y
707
709
NP2
P2
NP1
704
701
812
706
708
Q
811

FIG. 5B

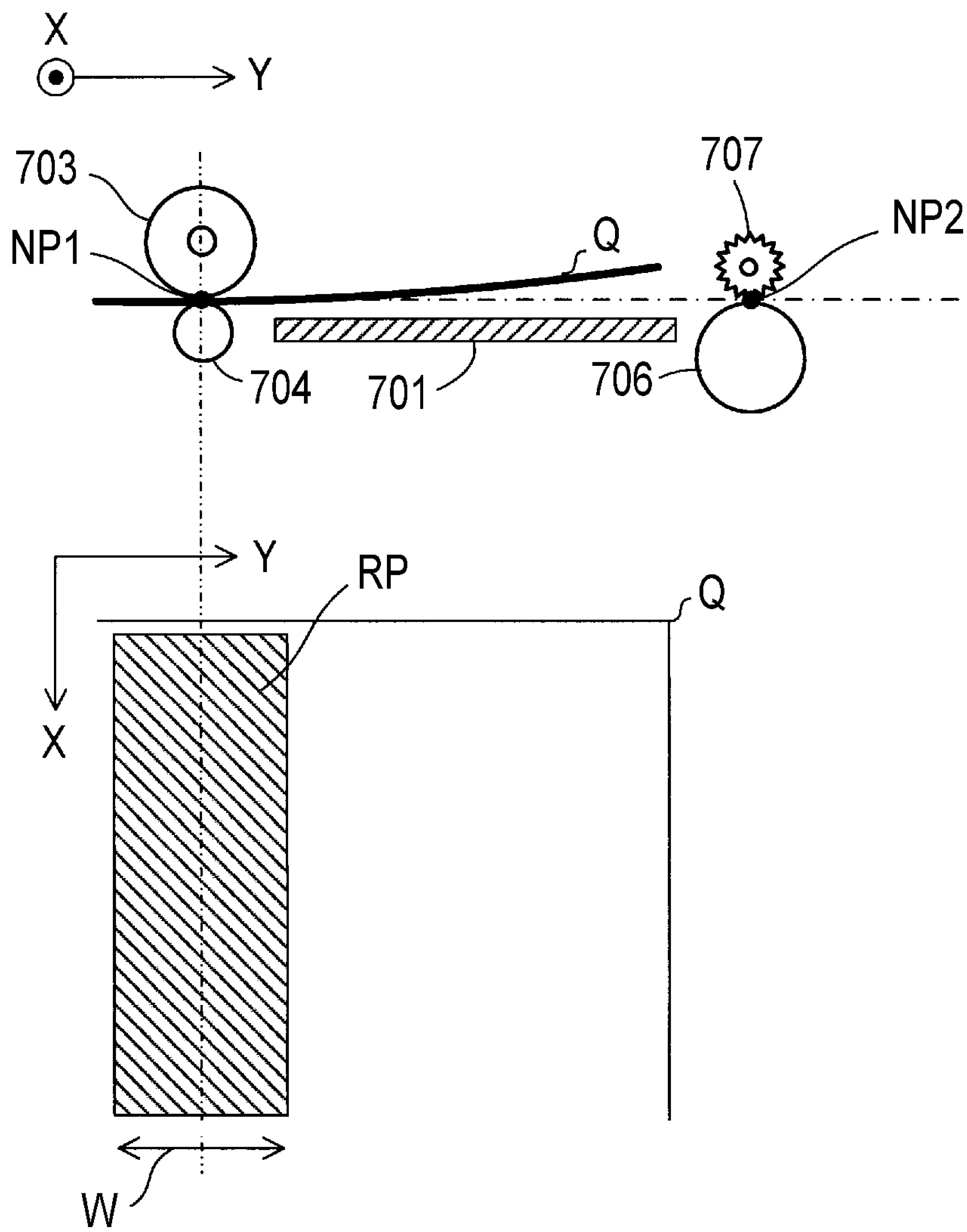


FIG. 6

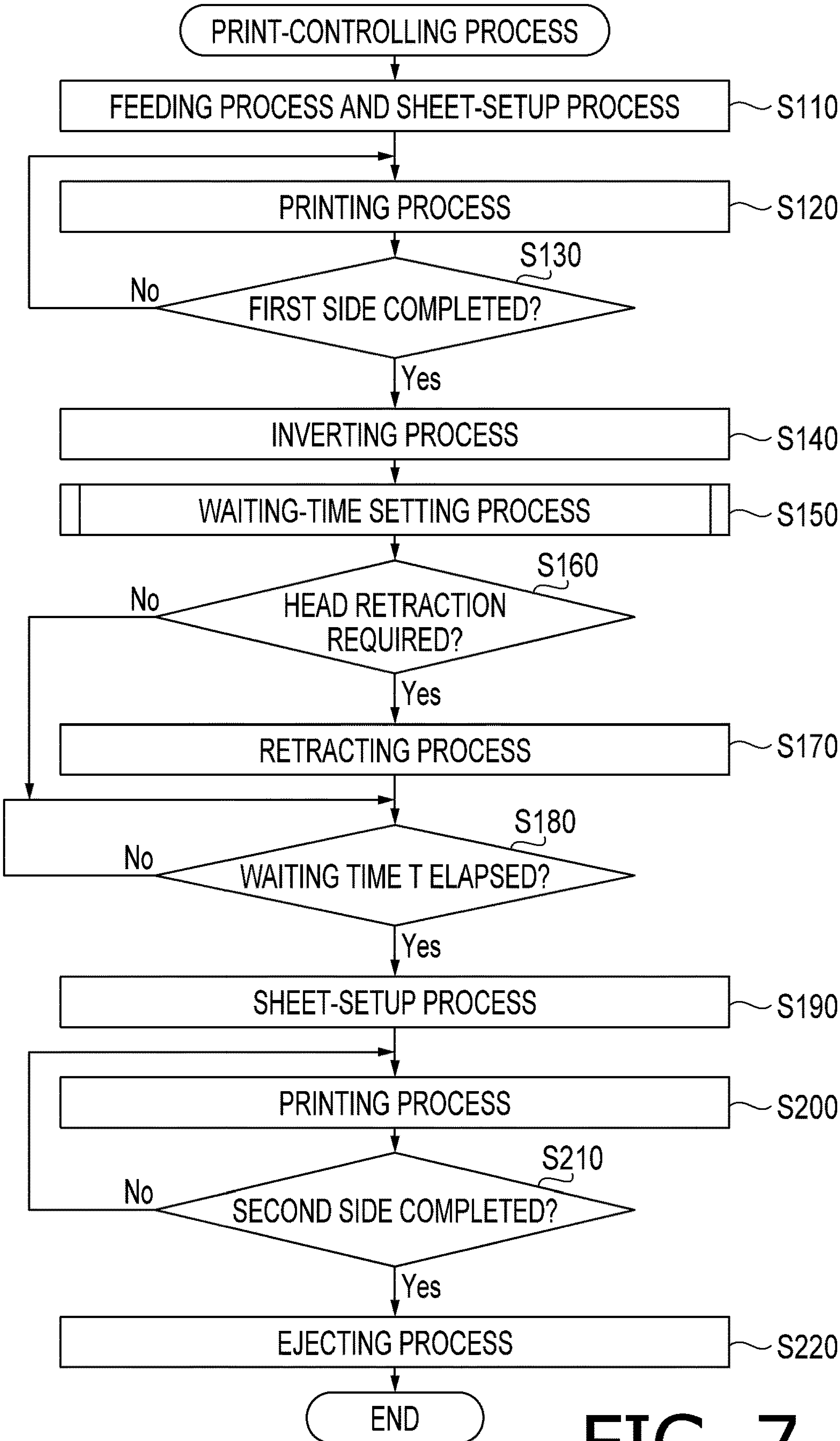

PRINT-CONTROLLING PROCESS
FEEDING PROCESS AND SHEET-SETUP PROCESS
S110
PRINTING PROCESS
S120
S130
FIRST SIDE COMPLETED?
No
Yes
INVERTING PROCESS
S140
WAITING-TIME SETTING PROCESS
S150
S160
HEAD RETRACTION REQUIRED?
No
Yes
RETRACTING PROCESS
S170
S180
WAITING TIME T ELAPSED?
No
Yes
SHEET-SETUP PROCESS
S190
PRINTING PROCESS
S200
S210
SECOND SIDE COMPLETED?
No
Yes
EJECTING PROCESS
S220
END

FIG. 7

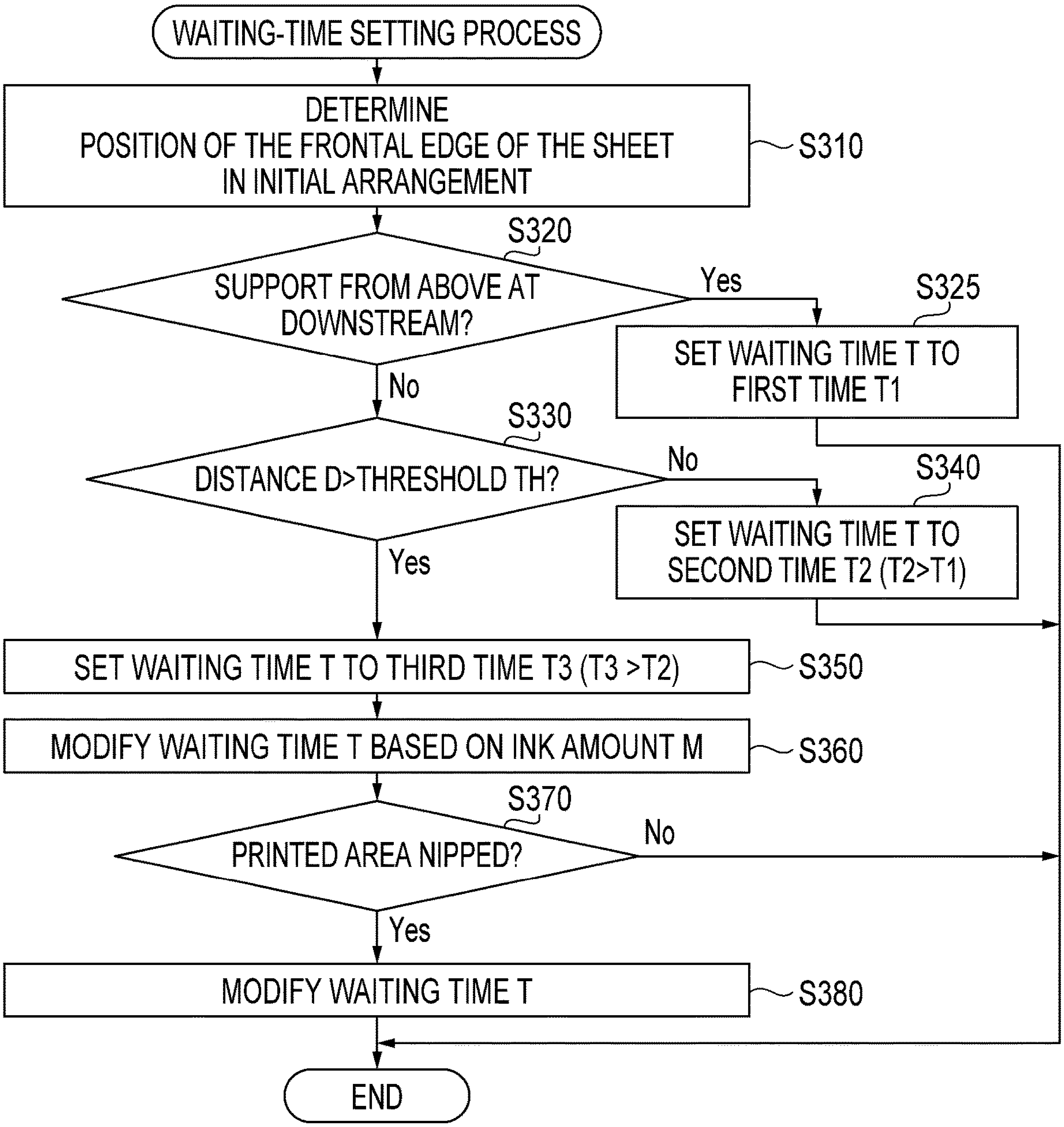

WAITING-TIME SETTING PROCESS
DETERMINE POSITION OF THE FRONTAL EDGE OF THE SHEET IN INITIAL ARRANGEMENT
S310
S320
SUPPORT FROM ABOVE AT DOWNSTREAM?
Yes
S325
SET WAITING TIME T TO FIRST TIME T1
No
S330
DISTANCE D>THRESHOLD TH?
No
S340
SET WAITING TIME T TO SECOND TIME T2 (T2>T1)
Yes
SET WAITING TIME T TO THIRD TIME T3 (T3 >T2)
S350
MODIFY WAITING TIME T BASED ON INK AMOUNT M
S360
S370
PRINTED AREA NIPPED?
No
Yes
MODIFY WAITING TIME T
S380
END

FIG. 8

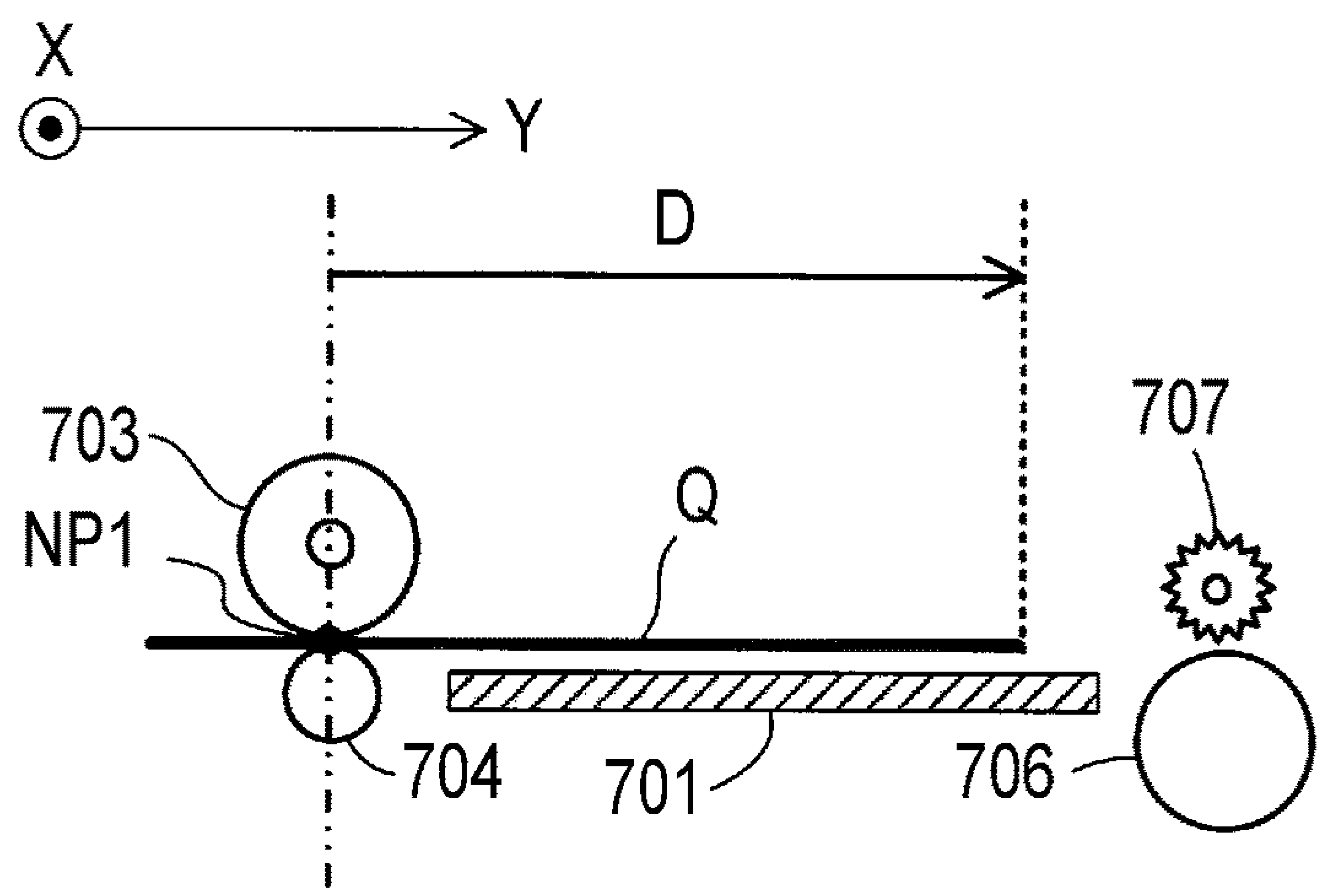

X
Y
D
703
NP1
Q
707
704
701
706

FIG. 9

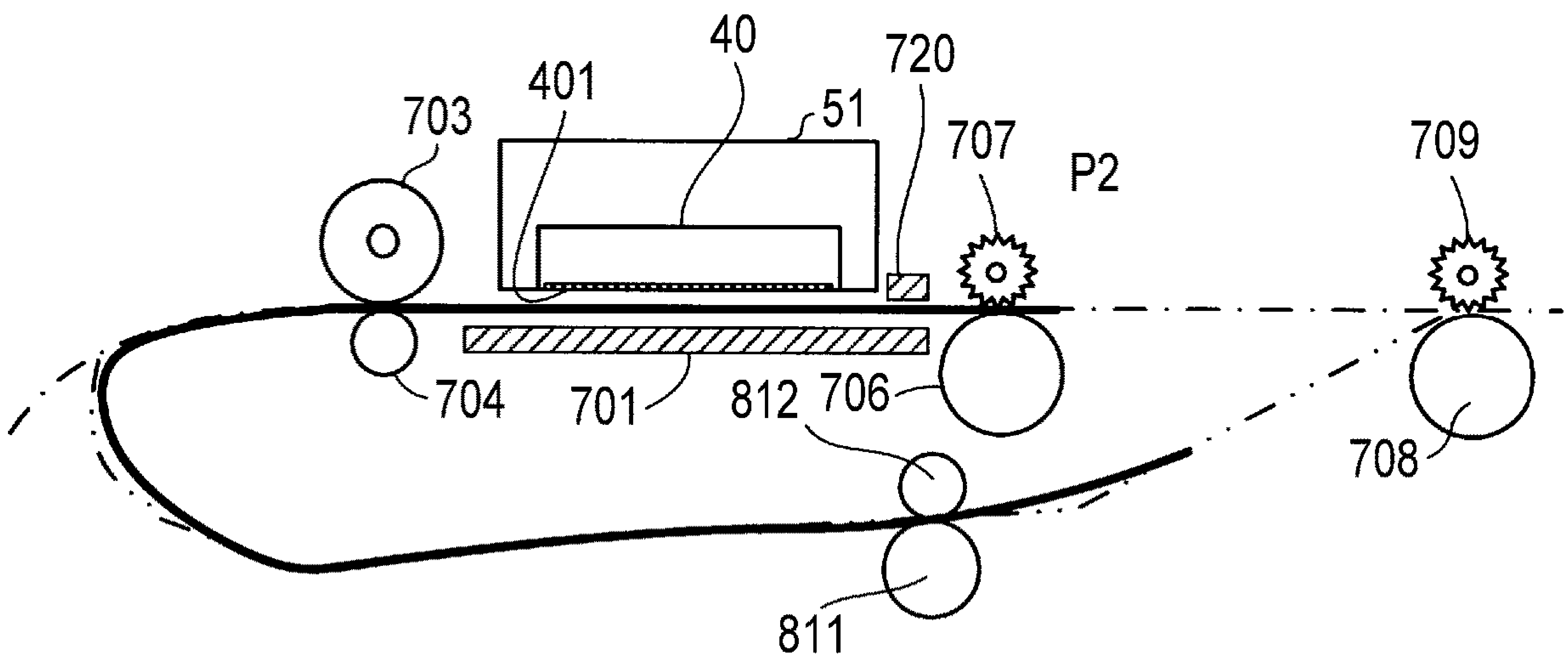

40
720
401
703
51
707
709
P2
704
701
812
706
708
811

FIG. 10

IMAGE FORMING SYSTEM AND METHOD TO CONTROL AN IMAGE FORMING SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority under 35 U.S.C. § 119 from Japanese Patent Application No. 2019-136137, filed on Jul. 24, 2019, the entire subject matter of which is incorporated herein by reference.

BACKGROUND

Technical Field

The following description is related to an image forming system and a method to control the image forming system.

Related Art

An inkjet printer capable of double-sided printing to form images on one and the other side of a sheet in ink is known. The inkjet printer may print the image on the one side of the sheet and may wait for the ink to dry on a surface of the first side of the sheet before starting to print another image on the other side of the sheet.

The inkjet printer may set a waiting period in accordance with printing coverage on the surface of the first side of the sheet, and after printing the image on the one side and waiting for the waiting period to elapse, the inkjet printer may restart conveying the sheet so that the ink may be restrained from adhering to conveyer rollers and being transferred onto the sheet. Thereby, an image forming quality, which may otherwise be lowered, may be maintained.

SUMMARY

As an inkjet printer discharges ink droplets at a sheet, an amount of moisture in the sheet may vary unevenly part by part depending on a shape of the image being printed, and the sheet may deform or warp partially. Due to the deformation of the sheet, a distance between the sheet containing the discharged ink and a discharging nozzle in a recording head may vary, and landing positions for the ink droplets on the sheet may deviate from intended positions. Thus, the quality of the image formed on the sheet may be lowered. In this regard, in order to restrain the quality of the image from lowering, allowing the ink to dry on the sheet may be important.

Meanwhile, setting a unified length to the waiting period for the ink to dry may extend an overall processing time for printing.

An aspect of the present disclosure is advantageous in that an image forming system, capable of double-sided printing and reducing a processing time for the image printing while considering dehydration of the ink, and a method to control the image forming system, are provided.

According to an aspect of the present disclosure, an image forming system, having a recording head, a sheet conveyer, an inverting mechanism, and a controller, is provided. The recording head is configured to discharge ink to form an image on a sheet. The sheet conveyer is configured to convey the sheet nipped at a plurality of nipping points in a sheet-conveying direction. The plurality of nipping points are located at positions upstream and downstream in the sheet-conveying direction with respect to a discharging position for the recording head to discharge the ink toward the sheet. The sheet conveyer is configured to convey the sheet fed from upstream to downstream in the sheet-conveying direction. The inverting mechanism is configured to invert the sheet, having been conveyed by the sheet conveyer in a posture with a first side thereof facing the recording head, to refeed to the sheet conveyer in a posture with a second side thereof facing the recording head. The controller is configured to control the recording head, the sheet conveyer, and the inverting mechanism. The controller is configured to determine an initial arrangement of the sheet in the sheet conveyer, the initial arrangement being an arrangement where image-forming on the second side of the sheet after being refed to the sheet conveyer starts, and control a length of a period between time, when image-forming on the first side of the sheet being conveyed by the sheet conveyer in the posture with the first side facing the recording sheet is completed, and time, when the image-forming on the second side of the sheet inverted by the inverting mechanism and refed to the sheet conveyer starts, based on the determined initial arrangement of the sheet in the sheet conveyer.

According to another aspect of the present disclosure, a method to control an image forming system, having a recording head, a sheet conveyer, and an inverting mechanism, is provided. The recording head is configured to discharge ink to form an image on a sheet. The sheet conveyer is configured to convey the sheet nipped at a plurality of nipping points in a sheet-conveying direction. The plurality of nipping points are located at positions upstream and downstream in the sheet-conveying direction with respect to a discharging position for the recording head to discharge the ink toward the sheet. The sheet conveyer is configured to convey the sheet fed from upstream to downstream in the sheet-conveying direction. The inverting mechanism is configured to invert the sheet, having been conveyed by the sheet conveyer in a posture with a first side thereof facing the recording head, to refeed to the sheet conveyer in a posture with a second side thereof facing the recording head. The method includes determining an initial arrangement of the sheet in the sheet conveyer, the initial arrangement being an arrangement where image-forming on the second side of the sheet after being refed to the sheet conveyer starts, and controlling a length of a period between time, when image-forming on the first side of the sheet being conveyed by the sheet conveyer in the posture with the first side facing the recording sheet is completed, and time, when the image-forming on the second side of the sheet inverted by the inverting mechanism and refed to the sheet conveyer starts, based on the determined initial arrangement of the sheet in the sheet conveyer.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

FIG. **1** is a block diagram to illustrate a configuration of an image forming system according to an embodiment of the present disclosure.

FIG. **2** is an illustrative view of a sheet conveyer and an inverting mechanism in the image forming system according to the embodiment of the present disclosure.

FIG. **3**A is an illustrative view of a sheet being conveyed for image-printing on a first side thereof in the image forming system according to the embodiment of the present disclosure. FIG. **3**B is an illustrative view of the sheet being directed to an inverting path in the image forming system according to the embodiment of the present disclosure.

FIG. **4** is an illustrative view of the sheet to be refed to the sheet conveyer through the inverting path in the image forming system according to the embodiment of the present disclosure.

FIGS. **5**A-**5**B are illustrative views of a first arrangement and a second arrangement of the sheet, respectively, set up in an initial arrangement before starting a printing process to a second side in the image forming system according to the embodiment of the present disclosure.

FIG. **6** is an illustrative view of a warp causable in a sheet in an image forming system.

FIG. **7** is a flowchart to illustrate a flow of steps in a print-controlling process to be conducted by a main controller in the image forming system according to the embodiment of the present disclosure.

FIG. **8** is a flowchart to illustrate a flow of steps in a waiting-time setting process to be conducted by the main controller in the image forming system according to the embodiment of the present disclosure.

FIG. **9** is an illustrative view of a distance between a nipping point and the leading edge of the sheet in the image forming system according to the embodiment of the present disclosure.

FIG. **10** is an illustrative view of a sheet conveyer with a sheet presser in the image forming system according to the embodiment of the present disclosure.

DETAILED DESCRIPTION

Hereinafter, with reference to the accompanying drawings, an embodiment according to an aspect of the present disclosure will be described in detail.

It is noted that various connections may be set forth between elements in the following description. These connections in general and, unless specified otherwise, may be direct or indirect, and this specification is not intended to be limiting in this respect. Aspects of the disclosure may be implemented in computer software as programs storable on computer readable media including but not limited to a random access memory (RAM), a read-only memory (ROM), a flash memory, an electrically erasable ROM (EEPROM), a CD-media, DVD-media, temporary storage, hard disk drives, floppy drives, permanent storage, and the like.

An image forming system **1** in the present embodiment shown in FIG. **1** is an inkjet printer having a main controller **10**, a print controller **30**, a recording head **40**, a head driver **45**, a carriage conveyer **50**, a carriage (CR) motor **53**, a linear encoder **57**, a conveyance controller **60**, a sheet conveyer **70**, an inverting mechanism **80**, a paper-feed (PF) motor **93**, and a rotary encoder **97**.

The main controller **10** includes a CPU **11**, a ROM **13**, a RAM **15**, and an NVRAM **17** and may control overall actions in the image forming system **1**. The CPU **11** executes processes in accordance with computer programs, which may be stored in the ROM **13**. The RAM **15** may provide a work area for the CPU **11** to run the computer programs. The NVRAM **17** may include a flash memory and/or an EEPROM and store various kinds of data therein. In the following paragraphs, processes to be conducted by the main controller **10** may be implemented by the CPU **11** running the computer programs.

The main controller **10** may communicate with an external device **5**, which may be, for example, a personal computer to receive image data. The main controller **10** controls, in order to form or print an image based on the image data received from the external device **5** on a sheet Q, the recording head **40**, the carriage conveyer **50**, the sheet conveyer **70**, and the inverting mechanism **80** through the print controller **30** and the conveyance controller **60**.

The print controller **30** may control a head driver **45**, which may drive the recording head **40**, to control actions to discharge ink droplets through the recording head **40**. The print controller **30** may control the CR motor **53** to control the carriage conveyer **50**. The CR motor **53** may be a direct current motor and is connected with the carriage conveyer **50** to serve as a driving source for the carriage conveyer **50**.

The carriage conveyer **50** includes a carriage **51** (see FIG. **2**), on which the recording head **40** is mounted. The carriage conveyer **50** may be driven by the CR motor **53** to move the carriage **51** to reciprocate along a main scanning direction. The main scanning direction coincides with an X-axis direction shown in FIG. **2**, in other words, a direction of normal line to the plane of FIG. **2**.

The print controller **30** may detect a position of the carriage **51** in the main scanning direction and a velocity of the carriage **51** based on encoder signals output from the linear encoder **57**, and based on the detected position and the velocity, control the CR motor **53**. Thus, the reciprocating movement of the carriage **51** and the recording head **40** may be enabled under the control of the CR motor **53**.

The conveyance controller **60** may control the PF motor **93** to control the sheet conveyer **70** and the inverting mechanism **80**. The PF motor **93** may be a direct current motor and is connected with the sheet conveyer **70** and the inverting mechanism **80** to serve as a driving source for the sheet conveyer **70** and the inverting mechanism **80**.

As shown in FIG. **2**, the sheet conveyer **70** includes a platen **701**, which is arranged at a position below the recording head **40**, to support the sheet Q from below. In other words, an upper surface of the platen **701** may serve as a supporting surface to support the sheet Q.

The sheet conveyer **70** includes a conveyer roller **703** and a pinch roller **704**, which form a first roller pair. The conveyer roller **703** and the pinch roller **704** are arranged to face each other at a position upstream from the platen **701** in a conveying direction to convey the sheet Q. The conveying direction coincides with a sub-scanning direction, which corresponds to a Y-axis direction shown in FIG. **2**. The Y-axis direction intersects orthogonally with X-axis direction being the main scanning direction.

The sheet conveyer **70** further includes a first ejection roller **706** and a first spur roller **707** forming a second roller pair. The first ejection roller **706** and the first spur roller **707** are arranged to face each other at a position downstream from the platen **701** in the sub-scanning direction being the conveying direction. Moreover, the sheet conveyer **70** includes a second ejection roller **708** and a second spur roller **709**, which are arranged to face each other at a position further downstream from the first ejection roller **706** and the first spur roller **707**.

The inverting mechanism **80** includes an inverting path **810** at a lower position with respect to the platen **701**. The inverting mechanism **80** may convey the sheet Q exiting the sheet conveyer **70** along the inverting path **810** and refeed the sheet Q to the sheet conveyer **70** from an upstream side in the sub-scanning direction.

As shown in FIG. **2**, the inverting mechanism **80** includes an inverting roller **811** and a driven roller **812**, which are arranged to face each other in the inverting path **810**. The inverting roller **811** is, as well as the first ejection roller **706** and the second ejection roller **708**, connected with the PF motor **73** through a driving force transmitter (not shown). The inverting roller **811** is rotatable in a single regular direction.

A dash-and-dot line and a dash-and-double-dots line in FIG. **2** show paths for the sheet Q to move there-along. The sheet conveyer **70** may, by controlling rotation of a feed roller (not shown), separate the sheet Q from other sheets Q stacked on a feeder tray (not shown), convey the separated sheet Q along a feeder path **710**, and feed the sheet Q to a nipping point NP**1** between the conveyer roller **703** and the pinch roller **704**.

The conveyer roller **703** is rotatable bi-directionally. In particular, the conveyer roller **70** may rotate in a normal direction when the PF motor **93** rotates in a normal direction and may rotate in a reverse direction when the PF motor **93** rotates in a reverse direction. The conveyer roller **703** may, when rotating in the normal direction according to the normal rotation of the PF motor **93**, convey the sheet Q at the nipping point NP**1** downstream in the sub-scanning direction. The conveyer roller **703** nipping the sheet Q at the nipping point NP **1** together with the pinch roller **704** may convey the sheet Q downstream by rotating.

The sheet Q being conveyed downstream by the rotation of the conveyer roller **703** may be supported by the platen **701** from below and travel through an area above the platen **701**, in which the sheet Q may face discharging nozzles **401** in the recording head **40**. The sheet Q may be conveyed further to exit the area above the platen **701** downstream, at which the first ejection roller **706** is arranged.

The sheet Q exiting the area below the recording head **40** may be nipped by the first ejection roller **706** and the first spur roller **707**. While the first ejection roller **706** is driven to rotate by the PF motor **93**, the sheet Q may be conveyed by the rotation of the first ejection roller **706** downstream. The first ejection roller **706** is rotatable bi-directionally, similarly to the conveyer roller **703**, and may rotate in a normal direction when the PF motor rotates in the normal direction and may rotate in a reverse direction when the PF motor rotates in the reverse direction. The first ejection roller **706** rotating in the normal direction may convey the sheet Q downstream in the sub-scanning direction.

Moreover, the second ejection roller **708** is rotatable bi-directionally. The second ejection roller **708** may, similarly to the first ejection roller **706**, rotate in a normal direction when the PF motor **93** rotates in the normal direction and may rotate in a reverse direction when the PF motor **93** rotates in the reverse direction.

In other words, when the second ejection roller **708** is driven by the PF motor **93** and rotates in the normal direction, the second ejection roller **708** may convey the sheet Q, having been conveyed by the first ejection roller **706** and reached the second ejection roller **708**, further downstream. At a position further downstream from the second ejection roller **708**, arranged is an ejection tray (not shown).

After a printing process to print an image on one side, e.g., a first side, of the sheet Q, in order to print another image on the other side, e.g., a second side, of the same sheet Q, the sheet Q may be conveyed to the first ejection roller **706**, and once the sheet Q passes through the first ejection roller **706**, rotating directions of the PF motor **93** may be switched, and the second ejection roller **708** may rotate in the reverse direction. The second ejection roller **708** rotating in the reverse direction may convey the sheet Q toward the inverting path **810**.

In particular, as the sheet Q moves downstream, a trailing end E**1** of the sheet Q**1** on an upstream side in the sub-scanning direction (see FIG. **3**A) moves beyond the first ejection roller **706** and the first spur roller **707** (see FIG. **3**B). When the trailing end E**1** of the sheet Q passes through the nipping point NP**2** between the first ejection roller **706** and the first spur roller **707**, the rotating direction of the second ejection roller **708** is switched to the reverse direction. As the second ejection roller **708** starts rotating in the reverse direction, the sheet Q moves along the inverting path **810** as indicated by a thick arrow shown in FIG. **3**B to return to the upstream side in the sub-scanning direction.

Thus, by the reverse rotation of the second ejection roller **708**, the sheet Q conveyed along the inverting path **810** may be fed to a position between the inverting roller **811** and the driven roller **812**, and by a force from the inverting roller **811**, the sheet Q may move further along the inverting path **810** to a merging point to merge with a feeding path **710** (see FIG. **2**). The sheet Q may further move along the feeding path **710** and, as shown in FIG. **4**, may be refed to the sheet conveyer **70** to reenter the nipping point NP**1** between the conveyer roller **703** and the pinch roller **704** in the sheet conveyer **70**.

Thus, the sheet Q moving through the inverting path **810** and the feeding path **710** reaching the nipping point NP**1** may be refed to the sheet conveyer **70** in a vertically inverted (upside-down) posture. As the sheet Q reenters the sheet conveyer **70**, the conveyer roller **703** is controlled to rotate in the reverse direction so that a frontal edge of the sheet Q may abut on the conveyer roller **703**. Thus, the conveyer roller **703** rotating in the reverse direction may restrict the refed sheet Q from being conveyed downstream beyond the nipping point NP**1** and the sheet Q may pause for a while. The rotating direction of the PF motor **93** may be switched to the normal direction thereafter.

When the rotating direction of the PF motor **93** is switched to the normal direction, the conveyer roller **703** starts rotating in the normal direction. The conveyer roller **703** rotating in the normal direction may convey the sheet Q refed to the sheet conveyer **70** downstream in the sub-scanning direction beyond the nipping point NP **1** and set the sheet Q at a specific position to start image-printing. For example, the sheet Q may be conveyed to a point P**1** to start, as shown in FIG. **5**A, at a position upstream from the first ejection roller **706** in the sub-scanning direction. For another example, the sheet Q may be conveyed to a point P**2** to start, as shown in FIG. **5**B, at a position downstream from the first ejection roller **706** in the sub-scanning direction. The position of the sheet Q to start printing may vary depending on a position of the image to be printed on the side sheet Q.

The sheet Q set at the starting position may be thereafter processed through for image printing in a printing process for the second side. After the printing process to the second side is completed, the sheet Q may be ejected outside to rest on an ejection tray (not shown), which is arranged downstream from the second ejection roller **708**.

It may be noted that, in double-sided printing, if the printing process is conducted to the second side of the sheet Q while the sheet Q with the ink discharged onto the first side is not substantially dry, the sheet Q may deform or warp upward as shown in an upper half of FIG. **6**. If the image is printed on the second side of the warped sheet Q, the distance between the second side of the sheet Q and the discharging nozzles **401** in the recording head **40** may not be maintained correctly. Therefore, the ink droplets from the discharging nozzles **401** may land on positions deviated from intended positions on the sheet Q, and the quality of the image printed on the second side of the sheet Q may be lowered.

Therefore, in order to restrain the image quality from lowering, the image forming system **1** may conduct a waiting process to wait for the ink to dry before the printing process to the second side of the sheet Q starts. However, when the initial arrangement for the sheet Q after the setup is in the arrangement shown in FIG. **5**B, the sheet Q is nipped between the first ejection roller **706** and the first spur roller **707** at the position downstream from the recording head **40**. In this arrangement, the sheet Q may be restrained from warping. In other words, even if the printing process to the second side of the sheet Q starts while the sheet Q still contains moisture, in terms of the form of the sheet Q, the moisture may not affect the quality of the image may largely.

In this regard, the image forming system **1** may determine an initial arrangement of the sheet Q after the setup, which is, for example, one of the arrangements shown in FIGS. **5**A and **5**B, and a waiting time T for the ink to dry may be adjusted in accordance with the determined initial arrangement. Thereby, the waiting time T may be restrained from being unnecessarily lengthened, and a throughput for the double-sided printing may be improved. In the following paragraphs, with reference to FIGS. **7-8**, a print-controlling process and a waiting-time setting process for the double-sided printing will be described.

The main controller **10** may conduct the print-controlling process, including the waiting-time setting process, as shown in FIGS. **7-8** when a command for the double-sided printing from the external device **5** is input. As the print-controlling process starts, in S**110**, the main controller **10** conducts a feeding process and a sheet-setup process.

In particular, in the feeding process, the main controller **10** may control the sheet conveyer **70** through the conveyance controller **60** to feed one of the sheets Q stacked on the feeder tray to the nipping point NP**1** between the conveyer roller **703** and the pinch roller **704**.

Further, in the sheet-setup process, the main controller **10** may control the sheet conveyer **70** through the conveyance controller **60** to set the sheet Q being fed to the nipping point NP**1** in an arrangement such that a frontal portion of an image-forming area on the first side of the sheet Q faces the recording head **40** and stays in a dischargeable area for the recording head **40**. In this context, the image-forming area may be an area on the first or second side of the sheet Q, in which an image is to be printed in the printing process, and the frontal part of the image-forming area on the first side of the sheet Q may mean a downstream portion of the image-forming area on the first side in the sub-scanning direction. The dischargeable area for the recording head **40** may be an area, at which the recording head **40** discharges ink droplets through the discharging nozzles **401**.

After the feeding process and the sheet-setup process, in S**120**, the main controller **10** conducts a printing process to the first side of the sheet Q. In particular, the main controller **10** may control the recording head **40**, the carriage conveyer **50**, and the sheet conveyer **70** through the print controller **30** and the conveyance controller **60** to form an image based on image data received from the external device **5** in the image-forming area on the first side of the sheet Q.

For example, the main controller **10** may control the carriage conveyer **50** through the print controller **30** to move the carriage **51** to an end along the main-scanning direction. While the carriage **51** moves along the main-scanning direction, the recording head **40** facing the sheet Q may be controlled for a discharging action to discharge ink droplets at the sheet Q to form the image in the dischargeable area that faces the recording head **40** on the sheet Q.

Moreover, after the discharging action by the recording head **40** to discharge ink droplets is completed at the end in the main-scanning direction, the main controller **10** may control the sheet conveyer **70** through the conveyance controller **60** to convey the sheet Q for a predetermined distance downstream in the sub-scanning direction. The carriage **51** may be moved to the other end in the main-scanning direction.

In S**120**-S**130**, the main controller **10** repeats the printing process until the image-forming to the entire image-forming area on the first side of the sheet Q is completed. When the main controller **10** determines that the image-forming to the entire image-forming area on the first side of the sheet Q is completed (S**130**: YES), the flow proceeds to S**140**. In S**140**, the main controller **10** conducts an inverting process.

In the inverting process, the main controller **10** may switch the rotating directions of the PF motor **93** through the conveyance controller **60** to control the sheet conveyer **70** and the inverting mechanism **80**. In particular, the main controller **10** switches the rotating directions of the PF motor **93** to cause the second ejection roller **708** to rotate in the reverse direction and the inverting roller **811** to rotate in the regular direction so that the sheet Q may be conveyed through the inverting path **810** to be vertically inverted and refed to the nipping point NP **1** between the conveyer roller **703** and the pinch roller **704**. At the time when the inverting process is completed, the frontal edge of the sheet Q pauses at the nipping point NP**1** and is restricted from moving downstream further inward in the sub-scanning direction in the sheet conveyer **70** beyond the nipping point NP**1**.

Following S**140**, in S**150**, the main controller **10** conducts the waiting-time setting process shown in FIG. **8** to set a waiting time T, for which the printing process to the second side of the sheet Q should wait to let the ink on the first side of the sheet Q to dry. The detailed steps in the waiting-time setting process will be described later below.

In S**160**, the main controller **10** determines whether the recording head **40** should retract from a pathway for the sheet Q being conveyed. The main controller **10** may determine that the recording head **40** should retract from the pathway when the waiting time T is equal to or shorter than a reference time. The reference time may be equal to a length of a first time T**1**, which may be set in S**325** (see FIG. **8**) as the waiting time T. Optionally, the reference time may be sparsely longer than the first time T**1** set in S**325**.

If the main controller **10** determines that the recording head **40** should retract (S**160**: YES), the flow proceeds to S**170**, in which the main controller **10** conducts a retracting process. In particular, the main controller **10** may control the carriage conveyer **50** through the print controller **30** to retract the recording head **40** to a maintenance position, which is set as a starting point of a movable range for the recording head **40** in the main scanning direction.

The maintenance position is located outside the pathway for the sheet Q in the main scanning direction. In other words, the maintenance position is a position, at which the recording head **40** may avoid interference with the sheet Q when the sheet Q is conveyed over the platen **701** downstream in the sub-scanning direction.

Following the retracting process in S**170**, the flow proceeds to S**180**. On the other hand, in S**160**, if the main controller **10** determines that the retraction of the recording head **40** is not necessary (S**160**: NO), the flow proceeds to S**180** without conducting the retracting process in S**170**.

In S**180**, the main controller **10** awaits arrival of an end of the waiting time T set in S**150**, in other words, lapse of the waiting time T set in S**150** since the placement of the frontal edge of the vertically inverted sheet Q to pause at the nipping point NP**1**. When the waiting time T elapses (S**180**: YES), the flow proceeds to S**190**, in which the main controller **10** conducts a sheet-setup process for the second side of the sheet Q.

In particular, in the sheet-setup process in S**190**, the main controller **10** may control the sheet conveyer **70** through the conveyance controller **60** to set the sheet Q being fed to the nipping point NP**1** in an arrangement such that a frontal portion of an image-forming area on the second side of the sheet Q faces the recording head **40** and stays in the dischargeable area for the recording head **40**.

Following the sheet-setup process, in S**200**-S**210**, similarly to S**120**-S**130**, the main controller **10** repeats the printing process until the image-forming to the entire image-forming area on the second side of the sheet Q is completed. When the main controller **10** determines that the image-forming to the entire image-formable area on the second side of the sheet Q is completed (S**210**: YES), the flow proceeds to S**220**, in which the main controller **10** conducts an ejecting process.

In the ejecting process, the main controller **10** controls the sheet conveyer **70** through the conveyance controller **60** to eject the sheet Q to rest on the ejection tray. Thereafter, the main controller **10** ends the print-controlling process.

In the following paragraphs, the waiting-time setting process in S**150** will be described with reference to FIG. **8**. As the waiting-time setting process starts in S**150**, in S**310**, the main controller **10** determines a position of the frontal edge of the sheet Q when the main controller conducts the sheet-setup process later in S**190** (see FIG. **7**) prior to the printing process to the second side of the sheet Q in S**200**. In other words, the main controller **10** determines a position of a downstream edge of the sheet Q in the sub-scanning direction after the sheet-setup process that will be conducted later.

In S**310**, the main controller **10** may calculate the position of the frontal edge of the sheet Q after the setup based on, for example, a distance of a margin in the sub-scanning direction between the image-forming area on the second side of the sheet Q and the frontal edge of the sheet Q.

More specifically, the main controller **10** may refer to the image data for the image to be printed on the second side of the sheet Q and calculate a distance in the sub-scanning direction between the frontal edge of the sheet and an area, in which data for a dot for the image is provided. Based on this calculated distance, the main controller **10** may thereafter estimate at least one of a distance between the frontal edge of the sheet Q after the setup and the nipping point NP**1** and a distance between the frontal edge of the sheet Q after the setup and the nipping point NP**2**. Based on the estimated distance(s), the main controller **10** may determine a position of the frontal edge of the sheet Q relative to the nipping points NP**1**, NP**2**, or the initial arrangement of the sheet Q.

Based on the position of the frontal edge of the sheet Q determined in S**310**, in S**320**, the main controller **10** determines whether the sheet-setup process in S**190** will place the sheet Q in an arrangement such that the sheet Q is supported to be suppressed from above at a position downstream from the recording head **40** in the sub-scanning direction. In other words, the main controller **10** may determine whether the determined position of the frontal edge is downstream from the nipping point NP**2**, which is between the first ejection roller **706** and the first spur roller **707**.

For example, when the determined position of the frontal edge of the sheet Q is downstream from the nipping point NP**2**, the sheet Q is in an arrangement such that the sheet Q is supported by the nipping force between the first ejection roller **706** and the first spur roller **707** to be restricted from warping upward.

If the main controller **10** determines that the sheet Q will be arranged to be suppressed from above (S**320**: YES), in S**325**, the main controller **10** sets the waiting time T to the first time T**1**. The first time T**1** is a shortest waiting time T among times that may be set for the waiting time T. Optionally, in S**325**, the waiting time T may be set to zero (0). After S**325**, the main controller **10** exits the waiting-time setting process and proceeds to S**160** (see FIG. **7**).

On the other hand, in S**320**, if the main controller **10** determines that the sheet Q will not be arranged to be suppressed from above (S**320**: NO), the flow proceeds to S**330**. In S**330**, the main controller **10** determines whether a distance D (see FIG. **9**) from the nipping point NP**1**, which is between the conveyer roller **703** and the pinch roller **704**, to the frontal edge of the sheet Q in the sub-scanning direction is greater than a threshold value TH.

If the distance D is equal to or smaller than the threshold value TH (S**330**: NO), in S**340**, the main controller **10** sets the waiting time T to a second time T**2**. After S**340**, the main controller **10** exits the waiting-time setting process and proceeds to S**160** (see FIG. **7**).

The second time T**2** is longer than the first time T**1**. In particular, the second time T**2** may be set to have a length, in which the ink should dry to an extent to moderate the warp in the sheet Q substantially in terms of the image forming quality, when the distance D from the nipping point NP**1** to the frontal edge of the sheet Q set up in S**190** is equal to or smaller than the threshold TH. A manufacturer of the image forming system **1** may determine a suitable value for the second time T**2** empirically.

In S**330**, if the main controller **10** determines that the distance D is greater than the threshold value TH (S**330**: YES), in S**350**, the main controller **10** sets the waiting time T to a third time T**3**. The third time length T**3** is longer than the second time length T**2** and may be set to have a length, in which the ink should dry to an extent to moderate the warp in the sheet Q substantially in terms of the image forming quality, when the distance D from the nipping point NP**1** to the frontal edge of the sheet Q set up in S**190** is greater than the threshold TH.

It may be noted that, if the sheets Q warp in a same inclination, the longer the distance D from the nipping point NP**1** is, the higher the frontal edge of the sheet Q may be located to be closer to the discharging nozzles **401** in the recording head **40**. Therefore, when the distance D is longer, in order to wait for the warp to be moderated, a longer time for the ink to dry may be required.

After S**350**, in S**360**, the main controller **10** modifies the waiting time T**3** set to the third time T**3** based on an ink amount M on the first side of the sheet Q. For example, if the ink amount M is equal to or less than a reference amount, the main controller **10** may not correct the waiting time T, but when the ink amount M is greater than the reference amount, the main controller **10** may correct the waiting time T by adding a predetermined length α to the third time T**3** (T**3**+α).

For another example, the main controller **10** may calculate the additional length α in accordance with the ink amount M, based on a function α=f(M), in which the ink amount M is the input variable and the additional length α is the output variable, and extend the waiting time T being the third time T**3** (T=T**3**) by adding the additional length α (T=T+α). The function f(M) may either be a monotonically increasing function or a monotonically non-decreasing function. The monotonically increasing function includes linear function, and the monotonically non-decreasing function includes step function, in which the additional length α increases stepwise in accordance with increase of the ink amount M.

Meanwhile, the ink amount M may be a liquid volume of the ink having been used for printing the image on the first side of the sheet Q, dimensions of areas, in which the image is printed, on the first side of the sheet Q, or may be a rate of the area dimensions, in which the image is printed on the first side of the sheet Q, with respect to an overall area dimension of the first side of the sheet Q. Moreover, the ink amount M may not necessarily be an amount of the ink having been used for the entire first side of the sheet Q but may be an amount of the ink having been used merely in a limited part of the first side of the sheet Q. For example, the ink amount M may be an amount of the ink having been used in an area, which may be placed in proximity to the nipping point NP**1**, in the sheet Q after the setup.

Meanwhile, the ink amount M may be merely an indication for adjusting the length of time for drying the ink required to moderate the warp in the sheet Q; therefore, the ink amount M may not necessarily demand strict accuracy. It may be noted that as the ink amount M increases, the longer time for the ink to dry to moderate the warp is required. The additional length α may be achieved empirically.

After S**360**, in S**370**, the main controller **10** determines whether a peripheral area around a printed area on the first side of the sheet Q is nipped between the conveyer roller **703** and the pinch roller **704**. The printed area may be an area, at which the ink droplets were discharged in the printing process to the first side of the sheet Q in S**120** (see FIG. **7**).

For example, when an area dimension of the printed area on the first side of the sheet Q falling in a specific part RP (see FIG. **6**) is equal to or greater than a predetermined dimension, the main controller **10** may make an affirmative determination in S**370**. The specific part RP is a hatched area in FIG. **6**, which is determined to be located in a range having a width W in the sub-scanning direction and centered at the nipping portion NP**1**. On the other hand, when the area dimension of the printed area falling in the specific part RP is smaller than the predetermined area dimension, the main controller **10** may make a negative determination in S**370**.

For another example, the main controller **10** may make the determination in S**370** based on an ink amount, e.g., a liquid volume of the ink, discharged at the printed area within the specific part RP on the first side of the sheet Q during the printing process. In particular, when the determined ink amount is equal to or greater than a threshold amount, the main controller **10** may make an affirmative determination in S**370**, but when the determined ink amount is smaller than the threshold amount, the main controller **10** may make a negative determination in S**370**.

It may be noted that the specific part RP shown in FIG. **6** is merely an example. The width W may either be larger or smaller than a diameter of the conveyer roller **703**. For another example, the center of the width W in the sub-scanning direction may not coincide with the nipping point NP**1** but may be displaced from the nipping point NP**1**. The specific part RP may be determined empirically.

While the ink is not substantially dry, and if the peripheral area around the printed area is nipped, the sheet Q tend to warp to a greater extent. Therefore, when the main controller **10** determines that the peripheral area is to be nipped (S**370**: YES), in S**380**, the main controller **10** may modify the waiting time T further by adding a predetermined length β and conclude the modified waiting time T being T**3**+α+β (T=T**3**+α+β) to be the length for the waiting time T.

The predetermined length β may either be a constant length or a variable length corresponding to the area dimension or the ink amount. For example, the main controller **10** may adjust the length to be added to the waiting time T based on the ink amount in the specific part PR. In other words, the main controller **10** may modify the waiting time T by adding a time β which is longer when the ink amount is greater. Thereafter, the main controller **10** may exit the waiting-time setting process and proceeds to S**160** (see FIG. **7**).

From S**160** and onward, the main controller **10** may wait for the waiting time T being T**3**+α+β to elapse, and thereafter, the main controller **10** may conduct the sheet-setup process (S**190**) and the printing process (S**200**) to the second side of the sheet Q.

In S**370**, meanwhile, if the main controller **10** determines that the peripheral area is not to be nipped (S**370**: NO), the main controller **10** concludes the waiting time T after S**360**, which is T**3**+α, to be the length for the waiting time T and exits the waiting-time setting process. From S**160** and onward, the main controller **10** may wait for the waiting time T being T**3**+α to elapse, and thereafter, conduct the sheet-setup process (S**190**) and the printing process (S**200**) to the second side of the sheet Q.

According to the image forming system **1** in the embodiment of the present disclosure, the nipping point NP**1** between the conveyer roller **703** and the pinch roller **704** may serve as a first point of action to support the sheet Q from above and below at the upstream position with respect to the discharging position, where the discharging nozzles **401** discharge the ink droplets, in the sub-scanning direction. Moreover, the nipping point NP**2** between the first ejection roller **706** and the first spur roller **707** may serve as a second point of action to support the sheet Q from above and below at the downstream position with respect to the discharging position, where the discharging nozzles **401** discharge the ink droplets, in the sub-scanning direction. In this regard, however, when the sheet Q is in the arrangement set in S**190**, the frontal edge of the sheet Q may or may not reach the nipping point NP**2** to be nipped between the first ejection roller **706** and the first spur roller **707**.

When the sheet Q in the arrangement set in S**190** is not nipped at the nipping point NP**2** between the first ejection roller **706** and the first spur roller **707**, the image may be printed on the second side of the sheet Q with the frontal edge released free. Therefore, if the printing process starts before the ink is substantially dried and the warp is moderated, the quality of the image to be printed on the second side of the sheet Q may be deteriorated.

On the other hand, when the sheet Q in the arrangement set in S**190** is nipped at the nipping point NP**2** between the first ejection roller **706** and the first spur roller **707**, the deterioration of the image quality due to the warp of the sheet Q may not occur inherently regardless of the wetness of the ink discharged at the first side of the sheet Q.

In consideration of the difference that may be caused by the arrangement of the sheet Q, the main controller **10** may determine the initial arrangement of the sheet Q, after the refeeding of the sheet Q to the sheet conveyer **70**, to start the image-forming action, or the printing process, to the second side of the sheet Q. Based on the determined initial arrangement of the sheet Q, the main controller **10** may modify the waiting time T and control the length between the time, when the image printing on the first side of the sheet Q is completed, and, after the inverted sheet Q is refed to the sheet conveyer **70**, the time when another image-printing on the second side of the sheet Q starts.

In particular, the main controller **10** may modify the waiting time T based on the position of the sheet Q relative to the first point of action, i.e., the nipping point NP**1**, and the second point of action, i.e., the nipping point NP**2**, to adjust the timing when the image-forming to the refed sheet Q should start.

Meanwhile, in the conventional inkjet image forming system, the waiting time to let the ink dry is set without considering the warping behavior of the sheet Q. Therefore, even in the case, where the sheet Q may be arranged after the setup at the position to be restrained from warping, as shown in FIG. **5**B, the waiting time to let the ink dry was provided, and the printing process was postponed unnecessarily.

In contrast, according to the embodiment of the present disclosure, when the sheet Q after the sheet-setup process is determined to be in the arrangement such that the frontal edge is supported by the first ejection roller **706** and the first spur roller **707** at the second point of action, in which the sheet Q is restrained from warping, the waiting time T may be set to be shorter to start the printing process to the second side of the sheet Q earlier. In this regard, the image forming system **1** may provide improved throughput and image-forming quality for double-sided printing.

In particular, according to the embodiment described above, when the frontal edge of the sheet Q is not nipped at the nipping point NP**2** but is released free, the waiting time T may be extended, if the distance D between the leading edge of the sheet Q and the nipping point NP**1** is longer, so that the printing process to the second side of the sheet Q may start later. In other words, when the frontal edge of the sheet Q is released free, the waiting time T may be adjusted suitably in accordance with the length of the time required for the warp of the sheet Q to be moderated.

Moreover, according to the embodiment described above, the waiting time T may be adjusted in consideration of the position of the printed area on the first side of the sheet Q after the setup relative to the nipping point NP**1**. In particular, when the printed area is located at an actable position, in which the sheet Q may be acted upon by the force from the conveyer roller **703** and the pinch roller **704**, i.e., the nipping point NP**1**, the waiting time T may be adjusted to be longer (S**380**; see FIG. **8**) compared to the arrangement, in which the printed area is not located at the affected position. In this regard, the tendency of the sheet Q, which may warp to a greater extent when the printed area is nipped by the conveyer roller **703** and the pinch roller **704**, may be restrained effectively by adjusting the waiting time T to let the ink dry suitably.

Moreover, according to the embodiment described above, when the waiting time T is set to the first time T**1**, which may be shorter than the time required to moderate the warp in the sheet Q, in S**170** (see FIG. **7**), the recording head **40** may be retracted from the pathway of the sheet Q before the frontal edge of the sheet Q passes through the dischargeable area for the recording head **40**. Thus, the recording head **40** may not interfere with the sheet Q. Therefore, while the sheet Q may be set up in the initial arrangement in the warped posture, the sheet Q may be restrained from interfering with the nozzles **401** of the recording head **401** and may be placed in initial arrangement sooner. In other words, the throughput in printing may be improved.

Although an example of carrying out the invention has been described, those skilled in the art will appreciate that there are numerous variations and permutations of the image forming system that fall within the spirit and scope of the invention as set forth in the appended claims. It is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or act described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims. In the meantime, the terms used to represent the components in the above embodiment may not necessarily agree identically with the terms recited in the appended claims, but the terms used in the above embodiment may merely be regarded as examples of the claimed subject matters. Below will be described examples of modifications to the present embodiment.

For example, the warping extent of the sheet Q may vary depending on different factors such as, for example, thickness and/or material of the sheet Q. Therefore, the first time T**1**, the second time T**2**, the third time T**3**, the additional length α, and the additional length β may be prepared for each type of the sheet Q that may be conveyed in the image forming system **1**. In other words, the image forming system **1** may store values for T**1**, T**2**, T**3**, α, and β for each of the types of the sheet Q that may be classified by the factors such as thickness and material in the NVRAM **17**. The main controller **10** may identify the type of the sheet Q to be currently conveyed and, based on the values T**1**, T**2**, T**3**, α, and β prepared for the identified type of the sheet Q, conduct the waiting-time setting process shown in FIG. **8**.

For another example, when the main controller **10** sets the waiting time T to the second time T**2** in S**340** (see FIG. **8**), the main controller **10** may modify the waiting time T with use of the additional length α, β, similarly to the modification of the first time T**1** in S**360**-S**380**.

For another example, the present disclosure may be applied to an image forming system **1** as shown in FIG. **10**, which has a sheet presser **720** at a position downstream from the recording head **40** and upstream from the first ejection roller **406** in the sub-scanning direction. The sheet presser **720** may press the sheet Q on the platen **701** from above. In this arrangement, in order to determine whether the sheet Q is in the arrangement, in which the sheet Q is supported from above at a position downstream from the recording head **40** in the sub-scanning direction in S**320**, the main controller **10** may determine whether the position of the sheet Q determined in S**310** is downstream from the sheet presser **720** in the sub-scanning direction. Thus, based on this determination, the main controller **10** may set the waiting time T as shown in FIG. **8**.

For another example, the inverting mechanism **80** may not necessarily be in the configuration shown in FIG. **2**, but an inverting mechanism may be arranged at a position upstream from the sheet conveyer **70**. For example, the first ejection roller **706** may rotate in the reverse direction to convey the sheet Q reversely upstream in the sub-scanning direction beyond an entrance of the sheet conveyer **70**, and when the sheet Q reaches the inverting mechanism, the sheet Q may be inverted upside-down by the inverting mechanism and conveyed downstream in the sub-scanning direction to reenter the sheet conveyer **70**.

In the embodiment described above, the image forming system **1** may control the length of the period between the time, when the printing process to the first side of the sheet Q is completed (S**130**), and the time, when the printing process to the second side of the sheet Q starts (S**200**), indirectly through the sheet-conveyance control by controlling the length of the period between the time, when the inverted sheet Q is fed to the nipping point NP**1** (S**140**), and the time, when the sheet-setup process to the second side of the sheet Q starts (S**190**). However, for another example, the image forming system **1** may control the length of the period between the time, when the printing process to the first side of the sheet Q is completed, and the time, when the printing process to the second side of the sheet Q starts, by controlling the length of the period between the time, when the sheet-setup process ends, and the time, when the printing for the second side of the sheet Q starts.

For another example, the image forming system **1** may control the length of the period between the time, when the printing process to the first side of the sheet Q is completed (S**130**), and the time, when the printing process to the second side of the sheet Q starts (S**200**), by controlling the timing when the inverted sheet Q is to be refed to the nipping point NP**1**.

In particular, the image forming system **1** may adjust the time to start the inverting process (S**140**), or may adjust the conveying velocity of the sheet Q in the inverting process (S**140**) to control the time to start the printing process to the second side of the sheet Q. In this arrangement, the main controller **10** may conduct the waiting-time setting process (S**150**) prior to the inverting process (S**140**). Optionally, a starting point to start the waiting action, in other words, a starting point of the waiting time may be a point, when the printing process to the first side of the sheet Q is completed.

In other words, the image forming system **1** may control the length of the period between the time, when the printing process to the first side of the sheet Q is completed, and the time, when the printing process to the second side of the sheet Q starts, by controlling at least one of the recording head **40**, the sheet conveyer **70**, and the inverting mechanism **80**.

For another example, the waiting time T may not necessarily be determined to be one of the second time T**2** and the third time T**3** in S**330** based on the comparison between the distance D and the threshold value TH, but the waiting time T may be adjusted continuously or stepwise in a predetermine range based on the distance D.

For another example, a function achieved through a single element in the embodiment described above may not necessarily be achieved by the single element alone but may be achieved by a plurality of distributed elements. For another example, functions achieved by a plurality of elements in the embodiment described above may be unified into a single element. For another example, a part of the configuration described in the above embodiment may be omitted or replaced with another configuration, or an additional configuration may be provided to the elements in the embodiment described above.

It is to be understood that the subject matter defined in the appended claims may not necessarily be limited to the specific features or act described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims. In the meantime, the terms used to represent the components in the above embodiment may not necessarily agree identically with the terms recited in the appended claims, but the terms used in the above embodiment may merely be regarded as examples of the claimed subject matters.

What is claimed is:

1. An image forming system, comprising:
a recording head configured to discharge ink to form an image on a sheet;
a sheet conveyer configured to convey the sheet nipped at a plurality of nipping points in a sheet-conveying direction, the plurality of nipping points being located at positions upstream and downstream in the sheet-conveying direction with respect to a discharging position for the recording head to discharge the ink toward the sheet, the sheet conveyer being configured to convey the sheet fed from upstream to downstream in the sheet-conveying direction;
an inverting mechanism configured to invert the sheet, having been conveyed by the sheet conveyer in a posture with a first side thereof facing the recording head, to refeed to the sheet conveyer in a posture with a second side thereof facing the recording head; and
a controller configured to control the recording head, the sheet conveyer, and the inverting mechanism, the controller being configured to:
determine an initial arrangement of the sheet in the sheet conveyer, the initial arrangement being an arrangement where image-forming on the second side of the sheet after being refed to the sheet conveyer starts, and
control a length of a period between time, when image-forming on the first side of the sheet being conveyed by the sheet conveyer in the posture with the first side facing the recording sheet is completed, and time, when the image-forming on the second side of the sheet inverted by the inverting mechanism and refed to the sheet conveyer starts, based on the determined initial arrangement of the sheet in the sheet conveyer.

2. The image forming system according to claim **1**,
wherein the sheet conveyer comprises a plurality of roller pairs at positions corresponding to the plurality of nipping points, each of the plurality of roller pairs being configured to nip the sheet fed thereto and convey the nipped sheet downstream by rotating, and
wherein the controller is configured to control the length of the period based on a position of the sheet relative to the plurality of roller pairs in the initial arrangement.

3. The image forming system according to claim **1**,
wherein the plurality of nipping points include:
a first nipping point located upstream with respect to the discharging position in the sheet-conveying direction; and
a second nipping point located downstream with respect to the discharging position in the sheet-conveying direction,
wherein the sheet conveyer includes:
a first roller pair located at a position corresponding to the first nipping point, the first roller pair being configured to nip the sheet being fed thereto and convey the nipped sheet downstream in the sheet-conveying direction by rotating; and
a second roller pair located at a position corresponding to the second nipping point, the second roller pair being configured to nip the sheet conveyed by the first roller pair and convey the nipped sheet downstream in the sheet-conveying direction by rotating, and
wherein the controller is configured to control, in a first case, in which the sheet in the initial arrangement is located at a position to be nipped by the first roller pair and by the second roller pair, the period to be shorter than the period in a second case, in which the sheet in the initial arrangement is located at a position to be nipped by the first roller pair but is not nipped by the second roller pair.

4. The image forming system according to claim **3**,
wherein, in the second case, the controller is configured to control the length of the period based on a distance between a frontal edge of the sheet in the determined

initial arrangement and the first nipping point such that the longer the distance is determined to be, the longer the controller controls the period to be.

5. The image forming system according to claim **1**, wherein the plurality of nipping points include:

a first nipping point located upstream with respect to the discharging position in the sheet-conveying direction; and

a second nipping point located downstream with respect to the discharging position in the sheet-conveying direction,

wherein the sheet conveyer includes:

a supporting surface configured to support the sheet being conveyed;

a roller pair located at a position corresponding to the first nipping point, the first roller pair being configured to nip the sheet being fed thereto and convey the nipped sheet downstream in the sheet-conveying direction by rotating; and

a sheet presser located at a position corresponding to the second nipping point, the sheet presser being configured to press the sheet conveyed by the first roller pair toward the supporting surface, and

wherein the controller is configured to control, in a first case, in which the sheet in the initial arrangement is located at a position to be pressed toward the supporting surface by the sheet presser, the period to be shorter than the period in a second case, in which the sheet in the initial arrangement is located at a position not to be pressed by the sheet presser with a frontal edge of the sheet being located upstream with respect to the sheet presser in the sheet-conveying direction.

6. The image forming system according to claim **5**, wherein, in the second case, the controller is configured to control the length of the period based on a distance between a frontal edge of the sheet in the determined initial arrangement and the first nipping point such that the longer the distance is determined to be, the longer the controller controls the period to be.

7. The image forming system according to claim **1**, wherein the plurality of nipping points include an upstream-side nipping point located upstream with respect to the discharging position in the sheet-conveying direction, and

wherein the controller is configured to control the length of the period based on a relative position of a specific part of the sheet, on which the image is formed in the image-forming prior to being inverted by the inverting mechanism, the relative position being a position of the specific part of the sheet in the initial arrangement relative to the upstream-side nipping point.

8. The image forming system according to claim **7**, wherein the controller is configured to control, in a case, in which the specific part of the sheet in the initial arrangement is located at an actable position, the actable position being a position where the sheet is acted upon by a force produced at the upstream-side nipping point, the period to be longer than in a case, in which the specific part of the sheet in the initial arrangement is not located at the actable position.

9. The image forming system according to claim **7**, wherein the controller is configured to control the length of the period based on the relative position and an amount of the ink discharged at the specific part on the first side of the sheet in the image-forming prior to being inverted.

10. The image forming system according to claim **1**, wherein the controller is configured to control the length of the period based on an amount of the ink discharged to form at least a part of the image on the sheet in the image-forming prior to being inverted.

11. The image forming system according to claim **1**, further comprising:

a carriage, on which the recording head is mounted, the carriage being configured to move in a direction intersecting with the sheet-conveying direction,

wherein the controller is configured to control the carriage, when a frontal edge of the sheet in the initial arrangement is determined to be located downstream with respect to the discharging position, to locate the recording head together with the carriage outside a pathway for the sheet to be conveyed.

12. A method to control an image forming system, the image forming system comprising:

a recording head configured to discharge ink to form an image on a sheet;

a sheet conveyer configured to convey the sheet nipped at a plurality of nipping points in a sheet-conveying direction, the plurality of nipping points being located at positions upstream and downstream in the sheet-conveying direction with respect to a discharging position for the recording head to discharge the ink toward the sheet, the sheet conveyer being configured to convey the sheet fed from upstream to downstream in the sheet-conveying direction; and

an inverting mechanism configured to invert the sheet, having been conveyed by the sheet conveyer in a posture with a first side thereof facing the recording head, to refeed to the sheet conveyer in a posture with a second side thereof facing the recording head,

the method comprising:

determining an initial arrangement of the sheet in the sheet conveyer, the initial arrangement being an arrangement where image-forming on the second side of the sheet after being refed to the sheet conveyer starts; and

controlling a length of a period between time, when image-forming on the first side of the sheet being conveyed by the sheet conveyer in the posture with the first side facing the recording sheet is completed, and time, when the image-forming on the second side of the sheet inverted by the inverting mechanism and refed to the sheet conveyer starts, based on the determined initial arrangement of the sheet in the sheet conveyer.

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